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Selection and Acquisition of Wetland Plant Species for Wetland Management Projects

PURPOSE: Wetland management projects often require the establishment of wetland plants under site conditions that affect plant establishment, growth, and reproduction. Wetland plant species selection is dictated by site-specific hydrology, soils, and energy from wind, waves, and currents. The purpose of this technical note is to discuss considerations for selection of plant species that will successfully tolerate wetland site conditions and meet the project goals.

PROJECT GOALS: The project goal is a primary factor to be considered when selecting plant species for a wetland management project. Goals affecting the species selection process include:

- Prevention of wind/water erosion.
- Flood storage/conveyance.
- Aquatic and wildlife habitat.
- Water quality enhancement.
- Aesthetic/heritage value.

Few plant species would be the optimal choice to accomplish all these goals. For example, plants differ in their ability to stabilize sediments. Unlike annuals, perennial species, such as trees and shrubs, generally have root systems that provide year-round protection against sediment erosion. Nutrient removal from inflow into a wetland may be increased in some cases by periodically harvesting the wetland plants that assimilate nutrients. In these cases, trees would be less desirable than herbaceous species.

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Although project goals may not address the need for plant species diversity, maximum species diversity is desired, for several reasons. Generally, wildlife diversity and usage increase with increased plant species diversity. More importantly, however, is the improved potential for project success. It is not possible to determine prior to project construction whether a plant species will be able to tolerate the managed site conditions. Uncontrollable factors, such as weather and infestations, can stress newly planted vegetation. If several species are planted on a project site, it is likely that at least some of them will survive under the unpredictable conditions experienced through time. In addition, a diversity of species will be more likely to resist invasive species and herbivores, as well as recover from disturbances.

SITE-SPECIFIC CONDITIONS: A critical step in plant species selection is to define the range of environmental conditions that characterize the project site conditions. Basic problems encountered in the establishment of marsh and aquatic plants are unfavorable water depths and fluctuations, nutrient deficiencies, excessive turbidity, excessive wind or current action, unsuitable substrates, and polluted sediments. Knowledge of the site history and landscape setting may indicate the presence of limiting factors that may not be visible. Most importantly, however, the hydrological conditions must be defined because these are the primary factors that limit wetland plant distributions.

These problems should be dealt with as the project plan is being developed, to the greatest possible extent. Plants will tolerate and, in part, ameliorate poor site conditions; however, too much stress on the plants will cause the project to fail.

ENVIRONMENTAL TOLERANCES: Plants are morphologically and physiologically limited with regard to where they are able to grow. The plant growth form (e.g., height, rooting depth, stem strength against breakage) largely determines whether or not the plant can, for example, withstand current and wave action, extend leaves above water level to avoid complete submergence, or spread into open areas by extending rhizomes. Physiological limitations of wetland plants are often related to attaining adequate light and oxygen to maintain a viable energy balance while submerged.

Water level management is key to determining the success of a wetland vegetation project. In fact, the zonation of plant species commonly observed in marshes and floodplains is primarily controlled by depth and duration of inundation. Turbidity, dissolved oxygen, pH, dissolved nutrients, and other water quality parameters are secondary controls on plant distribution, with salinity acting as an important control in coastal systems.

Tolerances to key environmental conditions have been determined for many wetland species. This information is available from commercial suppliers, the local USDA Soil Conservation Service, and several published sources (e.g., Kadlec and Wentz 1974, Environmental Laboratory 1978, Allen and Klimas 1986).

NATIVE SPECIES: Selection of appropriate plant species can be aided by observing vegetation in local wetlands similar to the designed wetland (reference wetland). These plant assemblages have developed under the prevailing environmental conditions and are adapted to them. Use of native species in conditions similar to where they naturally grow helps to ensure not only good survival and growth rates, but that the plants will likely be able to reproduce and maintain themselves.

Project conditions may exist, however, for which no comparable natural wetlands exist. In these cases, it is recommended that native wetland plant species be used that have wide environmental tolerance ranges and are likely to tolerate project conditions. It may be necessary to ameliorate site conditions by management techniques, such as repeated application of fertilizer or control of invasive

species, to maintain native species. Bioengineering techniques may be used to extend the natural range of plant species into high-energy areas.

Information on the growth and propagation of native wetland species in an area can be scarce. However, detailed listings of many wetland plants and the best propagule type for each can be found in articles by Hunt et al. (1978) and Environmental Laboratory (1978). Local USDA Soil Conservation Service plant specialists may have additional information on specific wetland plants in your area.

WETLAND PLANT ECOTYPES: It is necessary that the person obtaining plants for a wetlands vegetation management project be familiar with the concept of ecotypes. Studies of plant species with wide geographical ranges (altitudinal, latitudinal, climatic) have often shown reduced survival and growth rates of individual plants transplanted to environmental conditions different from those in which they originally grew (e.g., heat, cold, drought, soils, infestations, and flood tolerance). Even plants of the same species can die when inundated if they were grown from seeds collected in upland areas. Plants should be grown under or collected from conditions as similar as possible to the areas in which they will be planted.

Plants should be obtained from local sources. They should be transferred from areas within 100 miles latitude, 200 miles longitude, and 1,000 feet in elevation (Environmental Laboratory 1978, Gray and Leiser 1989, Pierce 1992). Growing concern is being expressed by ecologists, however, about unknown consequences of relocating genetic stock to new areas. For example, plants apparently become adapted to local pathogens, as well as beneficial mutualistic species, and their survival and growth are diminished when transplanted to different areas. The state of Florida has addressed this problem by specifying an even more limited collection area, that is, within a 50-mile radius, for plants used in wetland mitigation projects.

More detailed information on species range and growth habits is available in reports by Hunt et al. (1978) and Environmental Laboratory (1978).

SPECIES ACQUISITION AND AVAILABILITY: Additional factors that must be considered in the choice of wetland plant species include the following:

- Decisions about what species or seed source will be used.
- Nature of the chosen plant propagule.
- Date of planting.
- Number of plants required.
- Location where plants can be obtained.
- Method of transporting plants.
- Requirements and availability of storage facilities.
- Method of supervision required during planting.

The availability of an ample supply of the target species should be determined early in the planning stages of the project. Plants can be collected from areas in the region, maintained as stock in your greenhouse, or purchased from commercial suppliers. Each method of procurement has advantages and disadvantages. Lists of commercial suppliers are included in the following: Environmental Laboratory (1978), Hunt et al. (1978), Allen and Klimas (1986), Environmental Laboratory (1992).

Collecting the target species eliminates the cost of purchasing or growing propagules, while providing the most ecologically adapted plants for the area. It should be noted, however, that collecting native plants from natural areas is not always desirable. Plant collection may deplete natural populations to

the point that they are lost. Activities associated with collection may alter and harm the donor site. Most importantly, digging plants from existing wetlands may be a Section 404 violation. Regulatory assistance should be sought prior to digging in wetlands.

If collecting wetland plants from existing wetlands is found to be ecologically and legally acceptable, several points should be considered. Collection and logistics costs must be evaluated as they can be prohibitively high. Collection eliminates the need for storage and expertise in the growth and propagation of the target plants. Some expertise is required, however, to accurately identify the plants of choice and to ascertain the ecotypes that may be present. Care must be taken to avoid the inclusion of weedy species that grow with target plants and to leave the donor site as undisturbed as possible.

If space and labor are available, growing your own plants can lower the cost to the project considerably while providing the desired quantities of a number of species. Although the seed germination requirements of most wetland plants are not known, some degree of stratification is normally required when using seeds. Information about seed germination requirements is available from the USDA Soil Conservation Service. Plant propagules must either be collected from wild sources or obtained from a commercial supplier.

There are some concerns to be dealt with when growing your own plants. In a greenhouse setting, problems with fertilization, watering, and control of pests must be considered. Other disadvantages would include the necessity for devoting large amounts of greenhouse space to the growing stock, the need for personnel with expertise in growing plants, and the difficulty in breaking the winter dormancy requirements of these plants. Some hardening is usually required for greenhouse-grown plants before exposing them to harsher site conditions.

The decision to purchase the target plants entails certain precautionary steps. The ability of the supplier to make the scheduled deliveries within the time frame of the project is very important to the success of the endeavor. Include some flexibility when negotiating plant delivery to allow for unexpected delays. Allow time for the supplier to grow the target plants when planning your project, since many wetland plants are grown in large quantities only as the need arises.

Plant propagules should be guaranteed to be in optimum condition (healthy and of sufficient size) by the supplier, with the option of replacing any found to be unsatisfactory. It is a good practice to have the guarantee written in the contract and to have payment dependent on this fact. It is very important to ascertain what kinds of propagules are available, as this will dictate your planting methods and labor requirements.

In spite of taking the necessary precautions, plants can arrive in poor condition. Requesting samples of the desired propagule in advance will allow you to examine the plant and verify the accuracy of identification by the supplier. Plants obtained through a supplier will not be acclimatized to the planting site, and some additional time for this can be included in your project plan. By comparison shopping and reviewing previous experiences (of yourself and others) you can ascertain the dependability of the supplier prior to the planting deadline (Pierce 1992).

CONCLUSIONS: Selection and acquisition of wetland plants for a project includes a series of steps, which begins with the development of the project goals. Acquiring the plants and ensuring delivery to the site on schedule requires planning well in advance of the planting date. Proper attention to matching native species with site conditions is the key to successful plant establishment and growth.

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